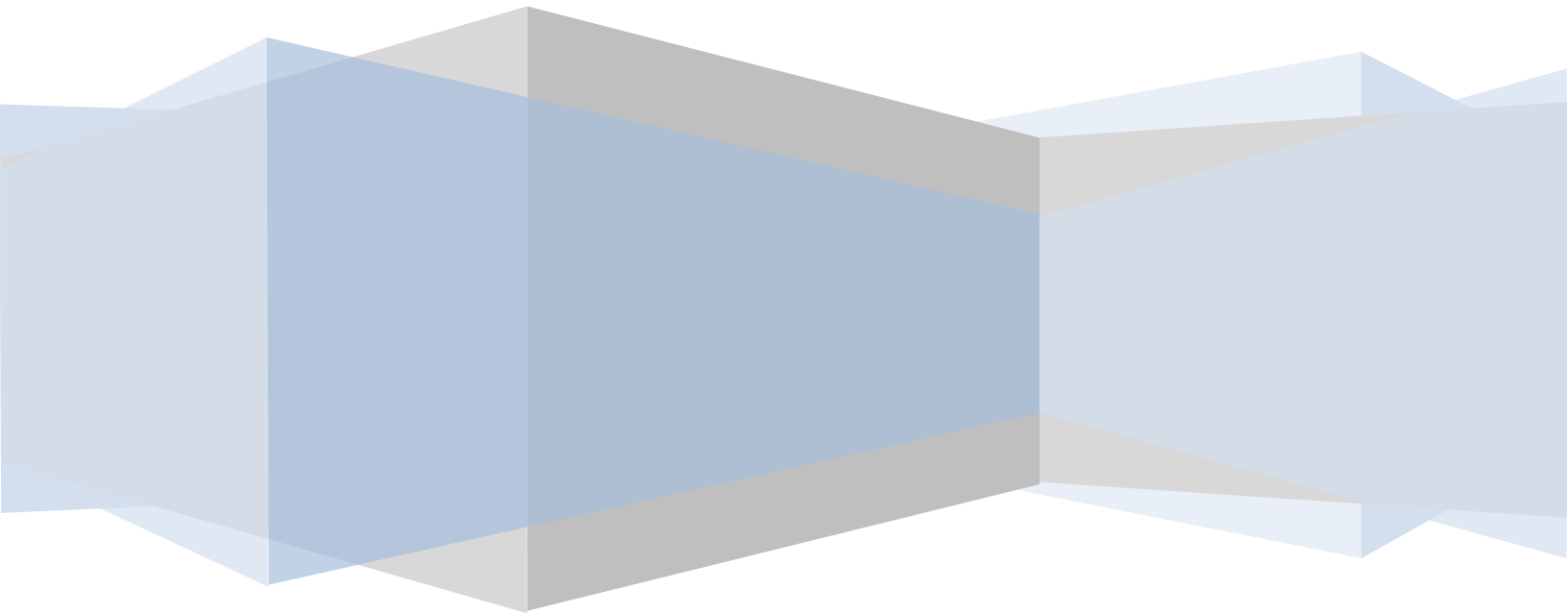


# Modeling and Simulation in the Commonwealth of Virginia

A Report from the Secretary of  
Technology's Office



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## Executive Summary

Representatives from the offices of the Secretary of Technology, Education, and Veterans Affairs promoted the modeling and simulation (M&S) sector in the Commonwealth of Virginia and searched for potential partnerships between academia and industry throughout 2011.

Some of the accomplishments from the year include:

- Establishment of webpage devoted to M&S on the Secretary of Technology's website
- Reception with Governor Robert F. McDonnell at the MODSIM World Conference and first Virginia Executives dinner at I/ITSEC (the largest training test and evaluation conference in the nation).
- Successfully competed for Phase II of Office of Economic Adjustment (OEA) grant
- Two modeling and simulation awards were added to the slate of Governor's awards at the Commonwealth of Virginia Innovative Technology Symposium (COVITS). This year's awardees were William and Mary and Old Dominion University.

A catalog of M&S assets at Virginia colleges and universities revealed seventeen schools conducting research using these technologies. Two schools in the Commonwealth of Virginia offer degree programs in modeling and simulation: Old Dominion University and Tidewater Community College.

## Background

In April 2011, Governor Robert F. McDonnell assembled an internal team of representatives from the Secretaries of Technology, Education, Commerce and Trade, and Veterans' Affairs to foster growth and diversification in the Commonwealth's Modeling and Simulation sector. Key contacts from each of these offices are listed below:

- Karen Jackson, Deputy Secretary of Technology
- Julie Gifford, Military Liaison in the Office of the Secretary of Veterans Affairs and Homeland Security
- Carrie Cantrell, Deputy Secretary of Commerce and Trade
- Emily Webb, Special Assistant to the Secretary of Education

Since that time, the team has dedicated themselves and leveraged resources from a variety of existing sources (Center for Innovative Technology, Virginia Economic Development Partnership (VEDP), and labor from the Governor's Fellows) to support research and outreach activities.

Representatives from the Governor's offices attended meetings throughout the year with member of the state's M&S community. These meetings helped strengthen relationships with leaders in government, industry, and academia, while reinforcing Virginia's commitment to M&S and promoting university collaborations.

## **Accomplishments**

### ***Conducted Modeling and Simulation asset inventory***

On April 26, 2011, then Secretary of Education Gerard Robinson sent a request to universities in the Commonwealth to provide information on university assets that perform, develop and/or leverage modeling and simulation technologies. Sixteen institutions of higher education responded to the Governor's request. The schools responses were used to create a report detailing each school's research and assets. The complete report can be found at the following website: <http://www.technology.virginia.gov/modeling.cfm>.

### ***Realigned M&S Advisory Council membership to reflect statewide emphasis***

On September 16, 2011, Governor McDonnell announced new appointments to the Modeling and Simulation Advisory Council. The M&S Council will help the Governor promote the industry nationwide by providing advice on policy and funding. Members of the council include:

- John T. Kenney of Sterling, Vice President of Corporate Development and General Manager Lynchburg Operations for TRAX International
- Jeanine McDonnell of Virginia Beach, Senior Program Manager for Test and Evaluation of Command Post Technologies
- Azhar Rafiq of Midlothian, Director of Medical Informatics for NASA Headquarters
- Beverly Seay of Winter Park, Senior Vice President and Business Unit General Manager for Science Applications International Corporation (SAIC)
- Bill Thomas of Suffolk, Associate Vice President of the Office of Governmental Relations at Hampton University.

### ***Supported NASA's development of a modeling and simulation Flexbook by distributing a press release soliciting collaborators (content developers) from the Commonwealth***

On August 1, 2011, the Secretary of Technology Jim Duffey and the Secretary of Education, Laura Fornash, called upon on practicing scientists, engineers and modeling and simulation practitioners to collaborate with the National Aeronautics and Space Administration (NASA) and the CK-12 Foundation on the development of a new modeling and simulation FlexBook. The FlexBook is being developed in an effort to improve the availability of K-12 resource material in modeling and simulation. The press release can be found at the following webpage: <http://www.technology.virginia.gov/News/viewRelease.cfm?id=859>.

### ***Added two modeling and simulation events to Governor's awards at the Commonwealth of Virginia's Innovative Technology Symposium (COVITS)***

The College of William and Mary, Old Dominion University, and the Virginia Institute for Marine Science won the award for Innovative Use of Modeling and Simulation Techniques for its Chesapeake Bay Inundation Prediction System. Below is a description of the project:

*“The Chesapeake Bay Inundation Prediction System (abbreviated as CIPS) was a collaborative effort between universities, industrial partner, and federal governments to develop a modeling system capable of making predictions of storm surge and inundation in the Chesapeake Bay during hurricanes and northeasters. Without proper warning, these extreme weather events can cause significant loss of life, disruption of infrastructure, and damage of property to the people of Commonwealth of Virginia. Using the parallel computing technology on the cluster computer machines (located at the College of William and Mary and Virginia Institute of Marine Science), the prototype of CIPS was successfully tested during Hurricane Isabel, 2003, Northeaster, November, 2009, and demonstrated in the recent Hurricane Irene, August 2011. The 30-hour (updated every 6 hours) real time forecast of wind, water level, and maximum surge provides invaluable information to the NWS and emergency managers to assess the situation in real time and minimize the damage by the natural hazard.”<sup>1</sup>*

The Virginia Modeling, Analysis and Simulation Center, located at Old Dominion University, received an award for cross-boundary collaboration in modeling and simulation. The research studied strategic mortgage default. The executive summary from the project can be read below:

*“The current economic crisis is, in large part, due to the collapse of the U.S. housing market. High rates of unemployment have caused many homeowners to (economically) default on their mortgages due to circumstances outside their control. Additionally, falling home prices and the prospect of being underwater for many years to come has caused countless others to voluntarily (strategically) default on their mortgage. While no one knows exactly how to measure when a strategic default, as opposed to an economic default, has occurred most studies strongly suggest that strategic defaults are on the rise. If this is the case, the recession currently experienced could become much more severe moving forward. We liken the increase in strategic default to the outbreak of a disease and incorporated epidemiology techniques into an Agent Based Simulation Model to propose solutions to the current real estate foreclosure contagion crisis plaguing the state’s economic health.”<sup>2</sup>*

### **Deputy Secretary of Technology, Karen Jackson, named to Interim Board for the new National Modeling and Simulation Coalition (NMSC)**

A new national organization, the National Modeling and Simulation Coalition (NMSC), is being formed. The NMSC will bring together constituents and stakeholders utilizing modeling and simulation in manufacturing, defense, medicine, energy, transportation, education, and other fields. The group will work on establishing a national agenda for modeling and simulation and encourage the industry’s use to support the nation’s economy, security, and welfare.

The inaugural event of the NMSC will be held on Monday, February 6, 2012 at the L’Enfant Plaza Hotel in Washington, D.C. Congressman Randy Forbes is scheduled to attend as well as 500 senior executives from corporations, government, and agencies across the nation. Scheduled speakers include Aneesh Chopra, Chief Technology Officer of the United States of America; Tom Lange of Proctor and Gamble, Dr. David Gaba, Associate Dean of Stanford

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<sup>1</sup> See: [http://www.covits.org/governor%27s\\_technology\\_awards/execSummaries.cfm#ChesapeakeBay](http://www.covits.org/governor%27s_technology_awards/execSummaries.cfm#ChesapeakeBay)

<sup>2</sup> See: [http://www.covits.org/governor%27s\\_technology\\_awards/execSummaries.cfm#StrategicMortgageDefault](http://www.covits.org/governor%27s_technology_awards/execSummaries.cfm#StrategicMortgageDefault)

Medical School; Dr. Sridhar Kota, White House Office of Science and Technology Policy; and John Kenney, TRAXX International.

### ***Modeling and Simulation Week in Virginia***

Recognizing the importance of the industry and M&S technologies to the state, Governor McDonnell declared October 9-15, 2011 as modeling and simulation week in Virginia. See Appendix A to view a copy of the proclamation.

### ***Created a Modeling and Simulation Page on the Secretary of Technology's website***

**Figure 1: Screenshot of M&S Webpage**



The new M&S page on the Secretary of Technology's website provides visitors with information on the M&S industry in the Commonwealth. The page contains updates on events, a link to the college and university asset inventory, and information on the advisory council. The link to the website was distributed to the attendees of the MODSIM World Conference through the following quick response (QR) code:

**Figure 2: M&S Webpage QR Code**



***Hosted reception for industry leaders during the MODSIM World Conference***

**Figure 3: Governor McDonnell Speaking with Business Leaders at M&S Reception**



In October 11, 2011, the offices of the Secretary of Technology and Education hosted a reception during the M&S World Conference in Virginia Beach, Virginia. The attendees at the invitation-only reception included leaders in business, academia, and government. The next day Governor McDonnell delivered the keynote address.

***Hosted Virginia “Executive Dinner” during I/ITSEC***

Representatives from the Secretaries of Technology’s office attended the Interservice/Industry Training, Simulation and Education Conference (I/ITSEC) in December 2011. Over 20,000 individuals registered for the 2011 conference, coming from countries like Russia, Turkey, Jordan and India. During I/ITSEC, the Commonwealth hosted two events – a Roundtable



discussion on national modeling and simulation priorities with Aneesh Chopra, U.S. Chief Technology officer, and an “Virginia Executives” dinner in partnership with the Virginia Economic Development Partnership for Virginia industry leaders at the conference featuring Secretary of Technology, Jim Duffey as the keynote speaker. Sixty participants from throughout Virginia attended the event including the representatives from the FBI, JCW (formerly JFCOM), George Mason University, University of Texas, Fort Lee, VMASC, the National Modeling and Simulation Coalition, Lockheed, TRAX, and MYMIC. The event was co-sponsored by TRAX, a Lynchburg M&S firm.

**Figure 4: Aneesh Chopra, Chief Technology Officer of the United States, speaking to I/ITSEC conference attendees**



***Successfully competed for a Phase II Office of Economic Adjustment (OEA) grant***

Veterans Affairs competed for a Phase II OEA grant. The funding will be used to examine the diversification of Hampton Roads M&S assets to markets outside the Department of Defense (DoD), identify potential market opportunities that would become available through partnering (in-state assets), and examine national market trends.

## Modeling and Simulation in the Private Sector

One of the top three states for modeling and simulation (M&S) research and industry, Virginia is home to approximately 198 companies that apply M&S technology and employ more than 11,300 people. Researchers at the Virginia Economic Development Partnership estimate that the direct economic output of \$1.7 billion and a total economic output of \$3.1 billion.

Researchers at the Virginia Economic Development Partnership (VAEDP) predict the industry will experience growth due to recent trends. Some of these trends include advancement in software that allows for institutions to conduct training using M&S technologies. This reduces costs, while allowing for more rigorous, detailed training. M&S also allows companies to lower the expenditures associated with product development. Industries adopting the use of this particular technology include: aviation and aerospace, education and training, emergency services, engineering and architecture, entertainment, information technology, manufacturing, medical technology, optics and photonics, transportation, urban planning, and microelectronics. For a sample of Virginia companies involved in these fields see Table 1.

**Table 1: M&S Companies Located in the Commonwealth of Virginia**

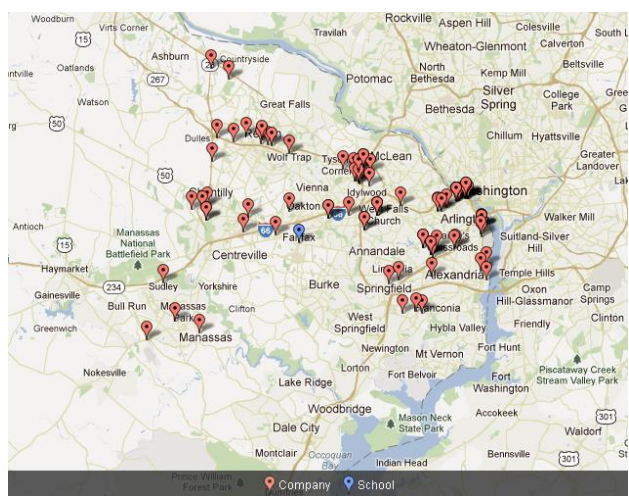
Industry	Corporations
Defense	Raydon Corporation Alion Science and Technology Mantech Command Controls Northrop Grumman Corporation SimVentions Lockheed Martin Veraxx Engineering Corporation Universal Systems & Technology, Inc. AAI Engineering Support, Inc. A-T Solutions
Aerospace	Advanced Technologies, Inc. Aerospace Computing, Inc. AeroTech Research Inc. American Systems Corporation Bihrl Applied Research, Inc. Eagle Aeronautics, Inc. Mainthia Technologies, Inc. Microbotic, Inc. Rockwell Collins Cobham Composite Products
Healthcare	MYMIC, LLC Elbit Systems of America, LLC Science Applications International Corporation (SAIC) Analytics Mechanics Association Dynamics Research Corp. SRA International Computer Sciences Corporation

Recognizing the importance of the technology, the Center for Innovative Technology (CIT)'s Commonwealth Strategic Roadmap for Technology release in November 2011 names M&S a “strategic priority” for Virginia. The report states:

*“Two of Virginia’s strongest and most promising sectors not only run across multiple regions but are also enabling technologies. The...Modeling and Simulation [sector] facilitates development in Transportation, National Security, Healthcare, Advanced Materials and Manufacturing, Energy, and Environment...Identifying and funding these high-impact technologies will have widespread benefit to individual regions and to the Commonwealth as a whole.”<sup>3</sup>*

The Roadmap advises the Commonwealth to devote more resources and institutional focus to encourage the growth of modeling and simulation.

**Figure 5: Northern Virginia**



Northern Virginia and the Hampton Roads regions are home to a large number of companies that utilize M&S technologies. This can be attributed to the proximity to the nation’s capital and military installations. The Hampton Roads region considers itself one of the leading regions for M&S, along with Orlando, Florida and Huntsville, Alabama. Hampton Roads Performs reports the M&S sector had a 41.2% increase in its contribution to the Gross Regional Product and a 25.4% increase in its total employment for the region between 2004 and 2007. The average salary in this section is \$82,733, which is higher than the region’s higher average of \$38,428.<sup>4</sup>

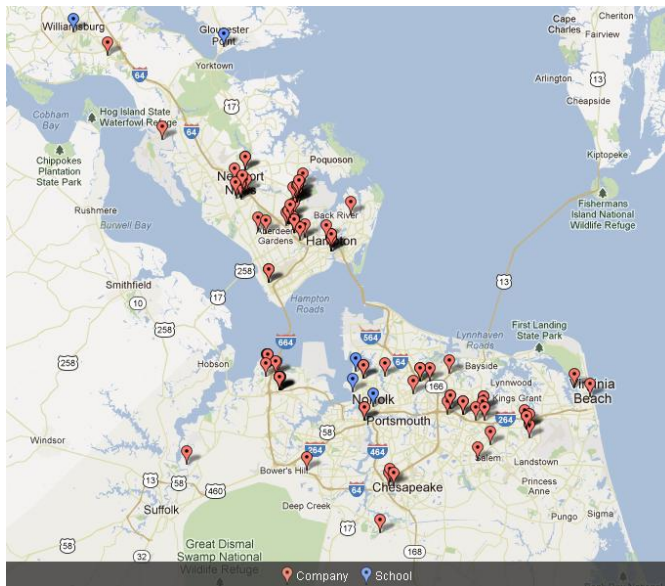
Located in Newport News, Insignia Technology Services, Inc. serves as an example of a successful M&S Virginia company. Insignia is an educational technology company that now serves a variety of public sector organizations. *Inc. Magazine* recently named Insignia as one of the 500 fastest growing companies in the United States. *Washington Technology* ranked Insignia as one of the 50 fastest growing businesses in the government section because of its compound annual growth rate of 199.76%.<sup>5</sup>

<sup>3</sup> See: [http://www.cit.org/sites/default/files/file/Roadmap\\_Phase%20I\\_112811\\_with%20Dedication.pdf](http://www.cit.org/sites/default/files/file/Roadmap_Phase%20I_112811_with%20Dedication.pdf).

<sup>4</sup> See: <http://hamptonroadspersforms.org/indicators/economy/modeling-simulation.php>.

<sup>5</sup> See: <http://washingtontechnology.com/fast50lists/fast-50-lists/2011.aspx>

**Figure 6: Hampton Roads**

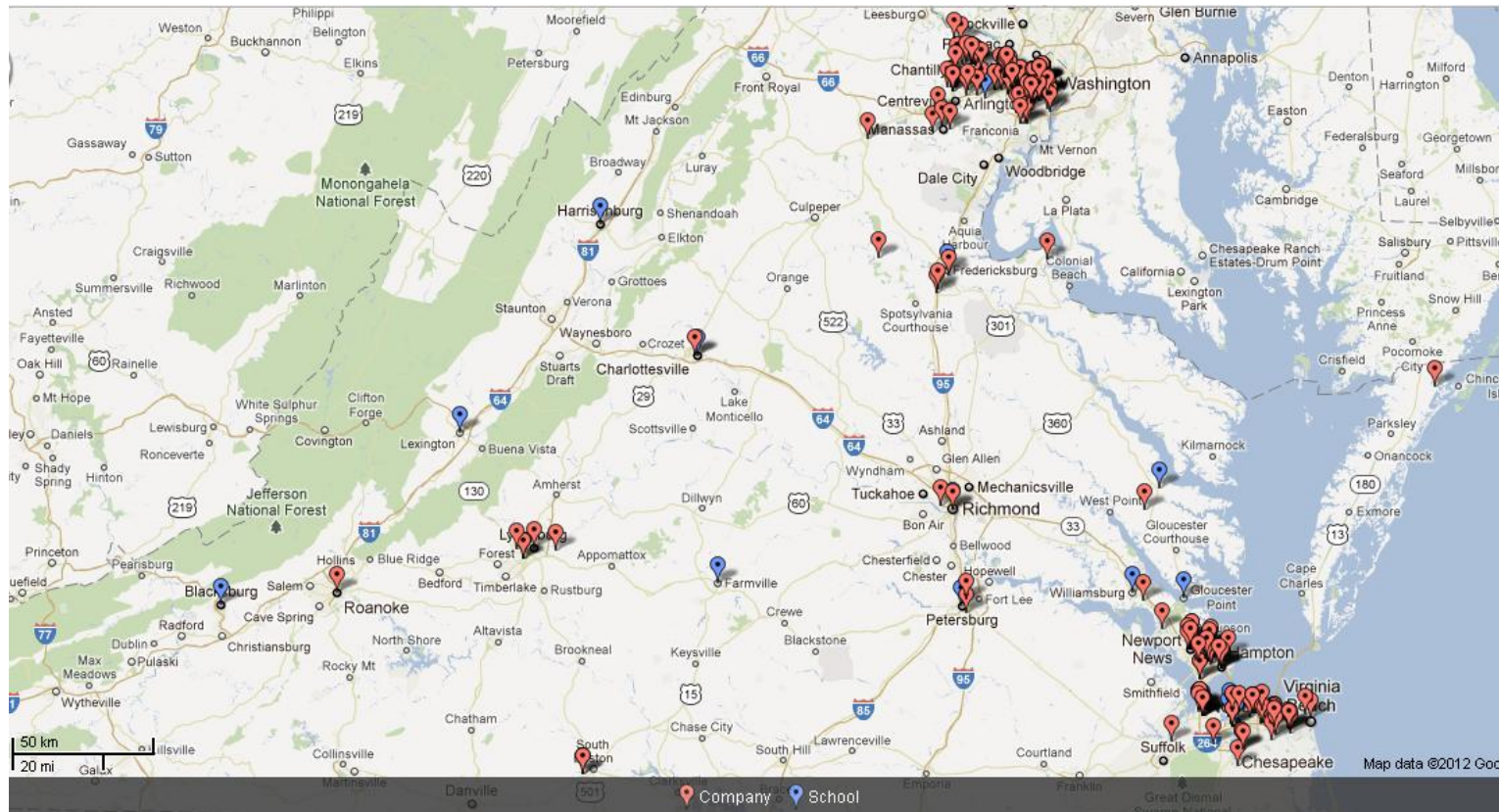


Academic institutions and corporations utilizing M&S technologies are not limited to the two regions. The Crater Region is in the midst of establishing the Virginia Logistic Research Center (VLRC). The Crater Region is comprised of the following localities: Chesterfield County, Charlest City County, Prince George County, Surry County, Sussex County, Greenville County, Dinwiddie County, Hopewell, Fort Lee, Petersburg, and Colonial Heights. Designed to be a collaboration between industry, government, and academic, the goal of VLRC is to “...create transformational improvements in the quality and cost of logistics systems to solve practical problems for industry and government.”<sup>6</sup> The key technology used to support the Center’s research focus area will be modeling and simulation.

<sup>6</sup> See: <http://www.craterpdc.org/vlrc/>



**Figure 7: Companies and Colleges Using M&S Technologies**



The above map provides a view of M&S assets across the Commonwealth. It includes colleges and universities across the state providing M&S courses and/or degree programs, as well as conducting research in the field. Companies utilizing modeling and simulation were added to this map as well. Military installations are not included on this map due to security concerns.

# Modeling and Simulation Assets at Colleges and Universities

Colleges and universities across the Commonwealth currently develop and leverage M&S technologies. A description of each university's work can be found in this section. A full copy of the report can be found at the following website:

<http://www.technology.virginia.gov/modeling.cfm>.

## **Old Dominion University**

**Old Dominion University**, located in Norfolk, is home to the Virginia Modeling, Analysis, and Simulation Center (VMASC). Touted as one world's leading research centers, VMASC's mission is the following:

*"...conduct collaborative modeling, simulation, and visualization (MS&V) research and development, provide expertise to government agencies and industry, and to promote Old Dominion University, Hampton Roads and Virginia as a center of MS&V activities."*<sup>7</sup>

Its applied research areas include: transportation, homeland security and military defense, social sciences, M&S interoperability, medicine and health care, game- based learning, and business and supply chain modeling.

**The Hampton Roads Hurricane Evacuation Simulation** was developed by VMASC to replicate multiple hurricane evacuation scenarios. **Virtual Port Simulations** trains and educates workers on the operation of various container movement equipment, such as cranes and container stackers.

**The Virtual Operating Room** combines live, virtual, and constructive simulation that allows future surgeons to practice surgical and decision-making skills in a realistic operating room setting not found in traditional medical school settings. **Patient Blood Management Simulator** is a patient blood management simulation to educate and train anesthesiologists and surgeons on these principles via a case-based simulation tool that tests their medical decision-making process while updating them with the latest techniques in this area.

Many projects have defense applications as well. Researchers developed an advanced data sharing methodology that allows for the connection of military simulations, military troops in the field, and military command and control systems in a seamless manner among US and coalition forces as part of the **Joint Advanced Concepts**.

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<sup>7</sup> See: <http://www.vmasc.odu.edu/about.html>

## **Eastern Virginia Medical College**

Eastern Virginia Medical College (EVMC), located in Norfolk, has collaborate with VMASC on several M&S projects. **The National Center for Collaboration in Medical Modeling and Simulation** (NCCMMS) is working to establish NCCMMS as a national leader in fostering collaboration and using simulation to improve health care.

**EVMS/Sentra Center for Simulation and Immersive Learning** provides teaching and assessment of communication and clinical skills for health care providers. Each program conducted by the Center is interactive, customized and designed to maximize learning and application of skills. **EVMS/Sentara Surgical Skills Center** teaches and assesses basic and advanced surgical skills.

## **George Mason University**

George Mason University, located in Fairfax, uses M&S for a variety of research projects. Research at the **Kasnow Institute** yields insights in areas of national and international security, climate change, humanitarian assistance disaster relief, vehicular traffic control, and human diseases

**The Center for Regional Analysis** researches economic and demographic trends in the Washington metropolitan area and the Commonwealth of Virginia. Ph.D. students in the **Climate Dynamics Program** conduct extensive research on the prediction and predictability of regional and global weather and climate.

**The Center for Secure Information Systems** does work in topological vulnerability analysis, cyber attack modeling and analysis, intrusion detection data mining, and visualization for information security. Its team of CSIS scientists and engineers has developed breakthrough patented technology for cyber attack modeling, analysis, and visualization. **The Computational Fluid Dynamics Center** is not only active in the development of methods, tools and codes for modeling and simulation in these areas, but also actively contributes to the advancement of knowledge in these fields by using a computational sciences approach.

## **Norfolk State University**

The Creative Gaming & Simulation Lab at Norfolk State University's work is centered around the research and development in game-based and interactive web-based applications as well as interactive training solutions for education, industry, and government. The Lab's research focus is on the design of innovative solutions that incorporate embedded assessment in the implementation of these educational and training tools.

## **Virginia Tech**

Located in Blacksburg, Virginia, Virginia Polytechnic and State University uses M&S to examine everything from socio-natural-engineered systems to health care. **The Transportation Institute** is dedicated to conducting research to save lives, time, and money in the transportation field by developing and using state-of-the-art tools, techniques, and technologies to solve transportation challenges.

**The Carilion Research Institute** provides state-of-the-art facilities for molecular medicine, imaging using lasers, high-power electron beams and magnetic resonance, high-capacity data handling, and human performance analysis. **Visionarium** focuses on the adoption of supercomputing and visual analysis tools to advance science, engineering, and education. Through educational and support services, the Visionarium boosts access to and adoption of cutting-edge tools that integrate with researchers' data, questions, and workflows.

Many of the M&S research at Virginia Tech has medical uses. Work at the **Virginia Bioinformatics Institute** (VBI) involves collaboration in diverse disciplines such as: mathematics, computer science, biology, medicine, pathology, biochemistry, systems biology, statistics, economics, and synthetic biology. Transdisciplinary research at the institute encompasses four scientific research divisions: Advanced Computing and Decision Informatics Laboratories, the Cyberinfrastructure Division, the Biological Systems Division, and the Medical Informatics and Systems Division. **The Institute for Critical Technology and Applied Science** supports and promotes cutting edge research at the intersection of engineering, science and medicine. Using powerful, state-of-the-art, parallel supercomputer systems available to Virginia Tech researchers, these cutting-edge M&S programs address fundamental and applied topics ranging from computational biology probing the intracellular mechanisms of cell division and metabolic pathways, to atomistic simulation of nano-scale defects in advanced materials under load.

## **University of Virginia**

Located in Charlottesville, the **JDRF Metabolic Simulation Core Facility** at the University of Virginia conducts research that is charged with developing the human metabolic model, with inclusion of new drugs and medical devices in the simulation platform.

Established in 2008, **The University of Virginia Alliance for Computational Science and Engineering (UVACSE)** seeks to transform computational research across Grounds. As the need for computational techniques in all disciplines increases, UVACSE serves researchers through education, consultation, and management of shared compute resources.

**The Cross-Campus** Grid brings together resources from around Grounds as well as at some participating external sites. The Grid provides access to a variety of heterogeneous resources (clusters of various sizes, individual parallel computers, and even a few desktop computers) through a standard interface, and leverages UVa's investment in hardware and making it



possible for large-scale high-throughput simulations to be run at a fraction of the typical investment necessary.

### Figure 8: Location of M&S Universities



### **Additional Research Conducted by College and Universities in the Commonwealth**

In addition to the programs described by the universities above, ten additional colleges and universities engage in modeling and simulation research in the Commonwealth of Virginia.

A professor at **Virginia Institute of Marine Science (VIMS)** at the **College of William and Mary** developed models to “represent transport processes within the coastal ocean and estuaries.” These can be used to understand the impact of pollution, climate change, and resource extraction.

Research at the Department of Mathematics at **The College of William and Mary** uses computational methods to solve optimization problems, while the Department of Physics uses M&S for energy research.

At **James Madison University**, research is conducted on the theory and application of network models, the differences between the chaotic waterwheel and sandwheel, and the dispersion of pollutants in the North and Middle rivers. Research at the Advanced Thermal-Fluids Laboratory focuses on thermal-fluid applications.

The “Teaching Through Technology and Innovative Practices” office at **Longwood University** provides professional development workshops to teachers. Teachers learn how to create simulations, digital learning environments, and integrate models and simulations. Longwood is one of the founding members of the Virginia Logistics Research Center, which solves supply chain problems. The Edward I. Gordon, M.D., Clinical Simulation Learning Center simulates patient experiences.

**The Southwest Virginia Community College’s** Nursing Workforce Diversity program utilizes M&S to allow students to experience treating patients. The school also boasts a birthing simulation and EMS/Life Support Simulations. Students gain experiences in the Administration of Justice program through mock crime scenes and observe the Virginia Police Academy using the “Use of Force” simulation. M&S is also used for students to gain real world experiences, as well as some of the gaming and robotics utilizes modeling and simulation.

A simulation lab will open in August 2011 at the nursing classroom facility at **Thomas Nelson Community College**. The Altria-funded Modeling and Simulation grant allows the faculty to develop 3D virtual labs using “Second Life” software.

A variety of initiatives leverage M&S at the **University of Mary Washington** including mathematics, geographic information systems, and economics.

The medical-surgical nursing courses at **Rappahannock Community College** require students to participate in campus labs that utilize moderate or high-fidelity mannequins that simulate the patient experience.

Modeling and simulation is utilized at **Virginia Military Institute** for geophysical modeling, biomedical signal processing, bioengineering modeling, and electrical and computer engineering.

Dr. M. Omar Faison, a biology professor at **Virginia State University**, received a grant from the U.S. Department of Education to increase participation among underrepresented minorities from Historically Black Colleges and Universities for masters degrees in modeling and simulation.

The DentSim simulation at **Virginia Commonwealth University** evaluates students' performance when cutting acrylic teeth, while the Image Guided Implantology (IGI) behaves as a GPS system for placing an implant and assists students to translate with their training. The School of Nursing uses simulation to teach students psychomotor skills, task training, and the skills of clinical reasoning and decision making. The Standardized Patient Program at the School of Medicine allows students to develop interviewing, counseling and physical exam skills working with a professional who is trained to exhibit signs and symptoms of specific diseases and to evaluate the student on the interaction.

## **M&S Degree Programs**

Colleges and universities in the Commonwealth of Virginia not only engage in research, but train students to use these technologies. Two schools in the Commonwealth of Virginia offer degree programs in modeling and simulation.

**Table 2: M&S Degree Programs**

<b>Thomas Nelson Community College</b>	The A.S. in Engineering and A.A.S. in Mechanical Engineering offer specializations in modeling and simulation.
<b>Old Dominion University</b>	Old Dominion University developed the first modeling and simulation doctorate degree program in the world. Students at the university can also pursue a B.S., and M.S.

Although many schools do not offer M&S degree programs, students interested in the field can take courses on the subject. At many schools, students must take courses in the Department of Computer Science. Table 3 provides a listing of schools that offer courses in this subject, as well as the expertise of the faculty members.

**Table 3: Schools Offering M&S Courses**

<b>Christopher Newport University</b>	Students can take courses through the Computer Science program at the University's department of Physics, Computer Science, and Engineering. Focus areas include neural network simulation, data simulation, and simulation software.
<b>George Mason University</b>	The Department of Computer Science at the School of Information Technology and Engineering offers courses at the graduate and undergraduate level. The research areas for the professors are visualization, computer vision, physics based modeling, and image based modeling.
<b>James Madison University</b>	The Department of Computer Science allows undergraduate and graduate students to take M&S course. Professors at the university study numerical modeling and simulation, discrete event modeling and simulation, experiment design, protein modeling, systems simulation, time series modeling, and analysis data visualization.
<b>Norfolk State University</b>	M&S courses are only available at the graduate level through the Department of Computer Science master's degree program.
<b>Old Dominion University</b>	Professors at the institution have an expertise

	in human-computer interaction, intelligent systems, artificial intelligence, neural networks and visualization. The professors at the university's areas of specialization include visualization and virtual reality.
<b>The College of William and Mary</b>	The Department of Computer science offer M&S coursework for undergraduate and graduate students. Research interests of the professors at the school include analytic modeling, high performance computing, and operations research.
<b>Tidewater Community College</b>	The community college offers an associate of applied science degree in modeling and simulation.
<b>University of Virginia</b>	Courses are available at the undergraduate and graduate level through the Department of Computer Science at the School of Engineering. The expertise of the faculty consists of visualization, virtual reality, artificial intelligence, and model development.
<b>Virginia Commonwealth University</b>	Professors at Virginia Commonwealth University study modeling and simulation visualization, virtual reality, artificial intelligence, and model development. Courses are only available at the graduate level.
<b>Virginia Polytechnic Institute</b>	Undergraduate and graduate students are able to take modeling and simulation courses. Professors in the Department of Computer Science specialize in multi-platform user interfaces, simulation theory, infrastructure simulation, virtual environments, virtual reality, augmented reality, artificial intelligence, multimedia systems, interaction-based modeling, biological modeling, human-computer interaction, visualization, traffic simulation, and medical simulation.

## Upcoming Initiatives

### ***Modeling and Simulation Summit***

Planned for April 2012, this summit will gather together leaders from throughout Virginia (government, academia, private industry) to discuss collaborative opportunities, emerging markets, and define the role of the Commonwealth as a catalyst in the process.

### ***Modeling and Simulation Corporate Directory***

Currently, the Secretary of Technology is assembling a list of companies that utilize M&S technologies. The list (as of the January 2012) contains over 300 contacts from private industry. The Office seeks to expand this list by creating a corporate directory as a companion to the university asset document as a means of facilitating collaboration and partnering amongst industry and academia.

### ***Modeling and Simulation Website***

In 2012, the Secretary of Technology's office will lead the development of a website promoting on the modeling and simulation industry in the Commonwealth. The website will contain:

- Resources for entrepreneurs
- An interactive map of private companies utilizing M&S technologies
- Summary of university assets
- Searchable online directory
- Information on M&S Advisory Board members
- Calendar of events
- Employment/internship opportunities

## **Appendix A:**

### **Modeling and Simulation Week Proclamation**

**WHEREAS**, Virginia is an international nexus for modeling and simulation, where industry, academic, and government organizations access the most innovative technologies for solving complex problems and making smarter decisions; and

**WHEREAS**, Modeling and Simulation teaching and education is vital to K-20 institutes of learning to achieve, enhance and lead the innovative edge for Virginians and beyond; and

**WHEREAS**, Critical sectors are increasingly reliant on Modeling and Simulation to support our military, Commonwealth preparedness, energy, telecommunications, transportation and logistics, and health and medicine; and

**WHEREAS**, Virginia is a voice and resource for the Modeling and Simulation industry nationally and internationally, working for the advancement of the Modeling and Simulation industry and as an advocate for Modeling and Simulation M&S issues of importance; and

**WHEREAS**, Continued cutting edge development and application of Modeling and Simulation will improve Virginia's economy and infrastructure, thus keeping Virginia at the forefront of innovation in the United States of America;

**NOW, THEREFORE**, I, Robert F. McDonnell, do hereby recognize October 9-15, 2011 as **MODELING AND SIMULATION WEEK** in our **COMMONWEALTH OF VIRGINIA**, and I call this observance to the attention of all our citizens.